

**DRAFT**  
**Engineering Evaluation**  
**USA Gasoline Corporation Station No. 20; Plant No. 18661**  
**Application No. 16637**

***Background***

Broadbent and Associates, Inc. has applied for an authority to construct for soil remediation at the site located at 2601 Road 20 in San Pablo, California. Soil vapor extraction will be accomplished by means of a regenerative vacuum blower (S-1) with a maximum capacity of 500 scfm. The vacuum unit is also equipped with a water knockout vessel, inlet filter, dilution air valve, recirculation valve, and flow indicators. Vapors from air stripper (S-2) will be combined with S-1 vapors for treatment by abatement device A-1. Vapor abatement will be achieved by three different means of abatement processes: Thermal Oxidation (Therm-Ox); Catalytic Oxidation (Cat-Ox); and Carbon Adsorption (Carbon). These will be applied according to equipment availability. The Therm-Ox and Cat-Ox will be equipped with continuous temperature monitoring to ensure that BACT destruction efficiencies are met. The Carbon adsorption system will consist of two 200 pound minimum capacity activated carbon vessels connected in series.

The applicant will be conditioned to provide written notification at the start of each phase of abatement. Emission monitoring for operation of the Therm-Ox, and the Cat-Ox will be conducted according to established Source Test methodology. Procedures are outlined in the conditions found below. The carbon unit influent and effluent VOC concentrations will be monitored with a portable flame-ionization detector (OVA-FID) on a schedule reflecting current loading rates and predicted Carbon capacity. To ensure proper operation of equipment and verify attainment of steady-state conditions, Carbon performance will be monitored daily for the first five days. Broadbent and Associates, Inc. may then elect to change their monitoring schedule based on measured influent concentrations and calculated carbon loading. Monitoring schedule changes will be allowed only after District review of concentration measurements and subsequent receipt of District approval.

This source is located within 1,000 feet of the outer boundary of Helms Middle School, and as such this application requires Public Notification via Reg. 2-1-412. A Public Notice was prepared and sent out to the home address of the students of the schools and to each address within a radius of 1,000 feet of the source.

***Emission Calculations***

**S-1: Soil Vapor Extraction System**

For a conservative estimate of yearly emissions, we shall assume that the system is operated for an entire year within an inlet concentration corresponding to the initial soil concentration level. Generalized assumptions follow:

- \* Operating conditions: Pressure = 1 Atm; Inlet Temperature = 21°C; 1 mole occupies 24.15L
- \* Molecular weight of TPHg = 100 g/mole (value for "weathered gasoline"). Molecular weight of Benzene = 78 g/mole.
- \* Influent values based on operational parameters of equipment and applicant supplied soil vapor test results: influent rate 500 scfm throughout; maximum influent concentration = 690 ppmv VOC, 1.1 ppmv benzene; destruction efficiency = 98.5% throughout.

**Emissions of Precursor Organics:**

$$690 \frac{\text{E-6}}{\text{min}} * 500 \frac{\text{ft}^3}{\text{min}} * \frac{1440 \text{ min}}{1 \text{ day}} * \frac{28.32 \text{ L}}{1 \text{ ft}^3} * \frac{1 \text{ mole}}{24.15 \text{ L}} * \frac{100 \text{ g}}{\text{mole}} * \frac{1 \text{ lb}}{454 \text{ g}} * (1 - 0.985) = \mathbf{1.931 \text{ lb/day (abated)}}$$

**Emissions of Toxic Air Contaminants (benzene):**

$$1.1\text{E-}6 * \frac{500 \text{ ft}^3}{\text{min}} * \frac{1440 \text{ min}}{1 \text{ day}} * \frac{28.32\text{L}}{1 \text{ ft}^3} * \frac{1 \text{ mole}}{24.15\text{L}} * \frac{78\text{g}}{\text{mole}} * \frac{1 \text{ lb}}{454\text{g}} * (1 - 0.985) = \mathbf{0.002 \text{ lb/day}} \text{ (abated)}$$

**Emissions of Toxic Air Contaminants (S-1):**

	(ppmv)		Emission (lb/day) (unabated)	Emission (lb/day) (with abated)	Emission (lb/yr) (with abated)	Emission (g/s) (with abated)
Benzene	1.1	1.10E-06	0.16	0.002	0.88	1.26E-05
Toluene	0.4	4.00E-07	0.07	0.001	0.38	5.41E-06
Ethyl-benzene	1.8	1.80E-06	0.36	0.005	1.95	2.81E-05
Xylenes	0.35	3.50E-07	0.21	0.003	1.14	1.64E-05
MTBE	0.42	4.20E-07	0.07	0.001	0.38	5.44E-06

**S-2: Ground Water Treatment System****Assumptions:**

- \* Contaminant concentrations in ground water: 6.5 ppmw POC, 0.026 ppmw benzene. (Based on groundwater sampling results provided by Broadbent and Associates, Inc.)
- \* Emission factors based on manufacturer guarantees. Limiting factor is the pump capacity of 25 gal/min. Liquid phase hydrocarbon removal efficiency of stripper = 100%. Liquid flow rate = 25 gal/min.

**Emissions of Precursor Organics (S-2):**

$$6.5\text{E-}6 * \frac{25 \text{ gal}}{\text{min}} * \frac{1440 \text{ min}}{1 \text{ day}} * \frac{8.337 \#}{1 \text{ gal}} * (1.0) * (1 - 0.985) = \mathbf{0.0293 \text{ lb/day}} \text{ (abated)}$$

**Emissions of Toxic Air Contaminants (benzene) (S-2):**

$$2.6\text{E-}8 * \frac{25 \text{ gal}}{\text{min}} * \frac{1440 \text{ min}}{1 \text{ day}} * \frac{8.337 \#}{1 \text{ gal}} * (1.0) * (1 - 0.985) = \mathbf{0.0001 \text{ lb/day}} \text{ (abated)}$$

**Emissions of Toxic Air Contaminants (S-2):**

	(µg/L)	(ppmw)		Emission (lb/day) (unabated)	Emission (lb/day) (with abated)	Emission (lb/yr) (with abated)	Emission (g/s) (with abated)
Benzene	26	0.026	2.60E-08	0.01	0.00012	0.04	6.15E-07
Toluene	130	0.13	1.30E-07	0.04	0.00059	0.21	3.07E-06
Ethyl-benzene	370	0.37	3.70E-07	0.11	0.00167	0.61	8.75E-06
Xylenes	1950	1.95	1.95E-06	0.59	0.00878	3.21	4.61E-05
MTBE	16	0.016	1.60E-08	0.00	0.00007	0.03	3.78E-07
TPH	6500	6.5	6.50E-06	1.95	0.0293	10.68	1.54E-04

**Total Benzene Emissions (S-1) & (S-2):**

$$0.002 \text{ lb/day (S-1)} + 0.0001 \text{ lb/day (S-2)} = \mathbf{0.002 \text{ lb/day}}$$

<b>Highest Daily Emissions</b>	=	<b>1.931 lb/day</b>
<b>Annual Average</b>	=	<b>1.931 lb/day</b>
<b>RFP</b>	=	<b>0.352 tons/yr</b>

### ***Toxics***

The applicant would like to keep the benzene emissions below the trigger levels listed in Regulation 2-5, Table 2-5-1. Therefore the emissions of toxic substances (Benzene) are not considered sufficient to warrant a Risk Screen Analysis. Benzene trigger = 0.018 lb/day. In accordance with the District's Regulation 2-5, the impact is then insignificant since this risk is within the threshold of 10 in a million as required for sources implementing TBACT; therefore, the Toxics Section has recommended the issuing of this A/C with a Benzene emission limit of 0.018 lb/day.

### ***New Source Review***

This proposed project will not emit over 10 lbs per highest day and is therefore not required to implement BACT. For Soil Vapor Extraction operations, BACT is defined as attainment of set destruction efficiencies corresponding to set influent concentration values. Operation of the Thermal/Catalytic Oxidizer, I.C.E., and the Carbon vessels will be conditioned to ensure attainment of the following required destruction efficiencies:  $\geq 98.5\%$  if inlet POC  $\geq 2000$ ;  $\geq 97\%$  if inlet POC  $\geq 200$  to  $< 2000$  ppmv;  $\geq 90\%$  if inlet POC  $< 200$  ppmv. Offsets need not be imposed as annual emissions will not exceed 10 tons.

### ***CEQA***

The project is considered to be ministerial under the Districts proposed CEQA Regulation 2-1-311 and therefore is not subject to CEQA review. The engineering review for this project requires only the application of standard permit conditions and standard emission factors and therefore is not discretionary as defined by CEQA. This project is in compliance with Chapters 9.1 & 9.2 of the permit handbook.

### ***Compliance***

Based on the information submitted, this operation is expected to be in compliance with Regulation 8-47-301, Emission Control Requirements, Specific compounds, and 8-47-302, Organic compounds. The POC emissions will be vented through a Thermal Oxidizer, Catalytic Oxidizer, or Carbon adsorption system at all times of operation. This project is within 1,000 feet from the nearest public school and is therefore subject to the public notification requirements of Regulation 2-1-412.

### ***Recommendation***

Recommend that a conditional Authority to Construct be issued for sources:

- S-1: Soil Vapor Extraction System consisting of a 500 max scfm vacuum blower, and ancillary equipment, abated by A-1, SVE Abatement System, consisting of either a Thermal Oxidizer, Catalytic Oxidizer, or at least two (200 lb minimum capacity) Carbon Adsorption Vessels arranged in series.
- S-2: Groundwater Treatment System consisting of a 25 gpm max capacity Air Stripper, and ancillary equipment, abated by A-1, SVE Abatement System, consisting of either a Thermal Oxidizer, Catalytic Oxidizer, or two (200 lb minimum capacity) Carbon Adsorption Vessels arranged in series.

**Conditions**

1. Precursor Organic Compound (POC) emissions from Sources S-1 and S-2 shall be abated by A-1, SVE Abatement System, consisting of either a Thermal Oxidizer, Catalytic Oxidizer, or two (200 lbs minimum capacity) Activated Carbon Vessels during all periods of operation. Start-up and subsequent operation of each abatement device shall take place only after written notification of same has been received by the District's Engineering Division. Soil Vapor flow rate from S-1 shall not exceed 500 scfm. Groundwater flow rate into S-2 shall not exceed 25 gpm. [basis: Reg. 8-47-301,2]
2. For each of the first three days of operation of the airstripper, at least one influent groundwater sample shall be collected and analyzed. At least one sample shall be collected and analyzed thereafter for each calendar month of operation. Samples shall be collected in accordance with the Regional Water Quality Control Board's analytical methods. [basis: Reg. 8-47-601]
3. The POC abatement efficiency of Abatement device A-1 shall be maintained at a minimum of 98.5% by weight for inlet POC concentrations greater than or equal to 2000 ppmv (measured as hexane). For inlet concentrations below 2000 ppmv and greater than or equal to 200 ppmv, a minimum abatement efficiency of 97% shall be maintained. For inlet concentrations below 200 ppmv, a minimum abatement efficiency of 90% shall be maintained. The minimum abatement efficiency shall be waived if outlet POC concentrations are shown to be less than 10 ppmv (measured as hexane). In no event shall Benzene emissions to the atmosphere exceed 0.018 pounds per day. [basis: Reg. 2-5, TBACT]
4. While operating as a Thermal Oxidizer, the minimum operating temperature of A-1 shall not be less than 1400 degrees Fahrenheit. While operating as a Catalytic Oxidizer, the minimum operating temperature of A-1 shall not be less than 600 degrees Fahrenheit.
5. To determine compliance with Condition Number 4, the Thermal/Catalytic Oxidizer shall be equipped with continuous measuring and temperature recording instrumentation. The temperature data collected from the temperature recorder shall be maintained in a file which shall be available for District inspection for a period of at least 2 years following the date on which such data are recorded. [basis: Reg. 1-523]
6. To determine compliance with Condition 3, within ten days after start-up of the Thermal Oxidizer, and within ten days after start-up of the Catalytic Oxidizer, the operator of this source shall:
  - a. Analyze inlet gas stream to determine the flow rate and concentration of POC present.
  - b. Analyze exhaust gas to determine the flow rate, and the concentration of Benzene and POC present.
  - c. Calculate the Benzene emission rate in pounds per day based on the exhaust gas analysis and the operating exhaust flow rate. The soil vapor flow rate shall be decreased, if necessary, to demonstrate compliance with Condition 2.
  - d. Calculate the POC abatement efficiency based on the inlet and exhaust gas analysis. For the purpose of determining compliance with condition 2, the POC concentration shall be reported as hexane.
  - e. Submit to the District's Engineering Division the test results and emission calculations within one month from the testing date. Samples shall be analyzed according to modified EPA test methods 8015 and 8020 or their equivalent to determine the concentrations of POC and Benzene.

7. The operator of this source shall maintain the following records for each month of operation of the Thermal Oxidizer or Catalytic Oxidizer:
  - a. Days and hours of operation.
  - b. Each emission test, analysis or monitoring results logged in for the day of operation they were taken.
  - c. Total throughput of soil vapor from source S-1 in Standard Cubic Feet.
  - d. Total throughput of groundwater through Source S-2 in thousands of gallons.

Such records shall be retained and made available for inspection by the District for two years following the date the data is recorded. [basis: Reg. 1-523]

8. During operation of the Activated Carbon Vessels, the operator of this source shall monitor with a photo-ionization detector (PID), flame-ionization detector (FID), or other method approved in writing by the District's Source Test Manager at the following locations:
  - a. At the inlet to the second to last Carbon vessel in series.
  - b. At the inlet to the last Carbon vessel in series.
  - c. At the outlet of the Carbon vessel that is last in series prior to venting to the atmosphere.

When using an FID to monitor breakthrough, readings may be taken with and without a Carbon filter tip fitted on the FID probe. Concentrations measured with the Carbon filter tip in place shall be considered methane for the purpose of these permit conditions.

9. These monitor readings shall be recorded in a monitoring log at the time they are taken. The monitoring results shall be used to estimate the frequency of Carbon change-out necessary to maintain compliance with conditions number 10 and 11, and shall be conducted on a daily basis. The operator of this source may propose for District review, based on actual measurements taken at the site during operation of the source, that the monitoring schedule be changed based on the decline in organic emissions and/or the demonstrated breakthrough rates of the carbon vessels. Written approval by the District's Engineering Division must be received by the operator prior to a change to the monitoring schedule.
10. The second to last Carbon vessel shall be immediately changed out with unspent carbon upon breakthrough, defined as the detection at its outlet of the higher of the following:
  - a. 10 % of the inlet stream concentration to the carbon bed.
  - b. 10 ppmv (measured as hexane).
11. The last Carbon vessel shall be immediately changed out with unspent Carbon upon detection at its outlet of 10 ppmv (measured as hexane).
12. The operator of this source shall maintain the following information for each month of operation of the Activated Carbon Vessels:
  - a. Hours and time of operation.
  - b. Each emission test, analysis or monitoring results logged in for the day of operation they were taken.
  - c. The number of Carbon vessels removed from service.
  - d. Total throughput of soil vapor from source S-1 in Standard Cubic Feet.
  - e. Total throughput of groundwater through Source S-2 in thousands of gallons.

Such records shall be retained and made available for inspection by the District for two years following the date the data is recorded. [basis: Reg. 1-523]

13. Any non-compliance with these conditions shall be reported to the Compliance and Enforcement Division at the time that it is first discovered. **The submittal shall detail the corrective action taken and shall include the data showing the exceedance as well as the time of occurrence.**
14. The operator shall maintain a file containing all measurements, records and other data that are required to be collected pursuant to the various provisions of this conditional Authority to Construct/Permit to Operate. All measurements, records and data required to be maintained by the operator shall be retained for at least two years following the date the data is recorded. [basis: Reg. 1-523]
15. Upon final completion of the remediation project, the operator of Sources S-1, and S-2 shall notify the Engineering Division within two weeks of decommissioning the operation.

by \_\_\_\_\_ date 11/2/07

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